

REMARKS

In the Office Action, dated September 28, 2004, the Examiner states that Claims 1 and 2 are pending, and Claims 1 and 2 are rejected. By the present Amendment, Applicant amends the claims.

In the Office Action, Claim 1 is rejected as being non-enabled with regard to the front side portion of the throughholes being shifted at the central portion. The Applicant has amended Claim 1 to exclude the central portion from this limitation.

In the Office Action, Claims 1 and 2 are rejected under 35 U.S.C. §103(a) as being unpatentable over US 5,830,373 (Ohtake et al.) in view of US 5,635,320 (Ohtake et al.). The Applicant respectfully disagrees with and traverses this rejection.

The essential difference in structure between the shadow masks as claimed in the present invention and each of the cited references, US '373 and US '320, is the shape of the openings of the throughholes at a front side hole portion through which the electron beam is emitted, and a rear side hole portion through which an electron beam enters.

As claimed in the present invention, each of the openings at a front and a rear side hole portion of the throughholes is a circular shape both at the central portion and the peripheral portion of the shadow mask as illustrated in FIGs. 2A and 2B in the drawings. On the other hand, the larger opening (which corresponds to the front side opening in the present invention) in US '373 is not a circular shape, but a bulged portion 42a is formed outward in a radial direction from the center of the shadow mask (col. 6, lines 61-65, Figs. 3B and 4B). It is described also in US '373 that the shape of the bulged portion is not limited to 42a shown in Figs. 3B and 4B, but an arcuated pattern and a divided arcuated pattern 52 shown in Figs. 6A and 6B, a linear pattern and a divided linear pattern 54 shown in Figs. 6C and 6D (col. 9 lines 9-51) may be formed. Also, the smaller opening (which corresponds to the rear side opening in the present

invention) in US '320 is not a circular shape either, but similar to the structure in the larger opening in US '373 as described. That is, an outward portion 40a is located outward in a radial direction with respect to the center of the shadow mask (col. 8, lines 9-14, Figs. 3, 4, 8 and 9). Similar to US '373, it is described also in US '320 that the shape of the outward portion is not limited to 40a shown in Figs. 3, 4, etc., but an arcuated pattern and a divided arcuated pattern 52 shown in Figs. 11A and 11B, a linear pattern and a divided linear pattern 54 shown in Figs. 11C and 11D may be formed (col. 11 line 52-col. 12, line 58).

In both US '373 and US '320, there is nothing described regarding the circular shape with respect to the openings at a front and rear side hole portion of the throughhole of the shadow mask, as in the present invention.

It should be noted that the shapes of the openings at a front side and a rear side of the throughholes (apertures) open to the surface of each shadow mask disclosed in the present invention and in US '373 & '320, are essential features for each invention in order to achieve the respective object of the invention in regard to the performance in passing and radiation of an electron beam as a shadow mask, mechanical strength and quality.

More specifically, it is described in US '373 that "the shadow mask 26 having those electron beam apertures 12 which are formed as described above can prevent omissions of electron beams passing through the electron beam apertures. Further, only that portion of the wall surface that is adjacent to the open edge of the large opening is made larger in diameter. As compared with a case where the entire wall surface which defines the large opening is made larger in diameter, the volume of the shadow mask 26 can remain high and its mechanical strength can be increased accordingly." (col. 12, lines 40-50)

It is also described in US '320 that "the present invention has been made in view of the above problems, and its object is to provide a color cathode ray tube in which a desired electron beam passes through an electron beam aperture without causing electron beam spot distortion, and in which even when an electron beam collides against an aperture side wall, a reflected electron beam

will not cause an unnecessary phosphor to emit light, and a method of manufacturing the same." (col. 3, lines 21-28).

It is natural that a person skilled in the art could not change the shape of the openings at a front side and a rear side of the throughholes (apertures) in the shadow mask disclosed in the present invention and in US '373 & '320 with each other, since these are essential features in these inventions, in order to achieve the particular purpose thereof. If these are changed, the particular purpose of each invention could not be achieved as a matter of course.

Further, in the present invention the taper size T is defined as an average value of the individual portions of the taper surfaces, which is represented by the formula $T = (S-Q)/2$, wherein S denotes the hole width at the end of said front side hole portion and Q denotes the hole width at said ridge portion, and said taper size T is within a range of from 30 to 40% of the thickness of the shadow mask. Although the rejection asserts the value disclosed in US '373 (col. 7 lines 44-51) satisfies the taper size $T = (S-Q)/2$ is within a range of 30-40% of the thickness of the shadow mask as claimed, presuming the large opening diameter D disclosed in US '373 corresponds to the hole width S in the present invention and the small opening diameter d in US '373 corresponds to the hole width Q in the invention, the Applicant considers this assertion to be absurd and farfetched, based solely upon the above presumptions, and not on what is clearly disclosed. As mentioned above, since each shape of the front side hole portion in the invention and in US '373 is different from each other, comparison itself of these values of large and small diameter in an opening, and thickness of a shadow mask have no meaning.

It is pointed out that in the shadow mask in the present invention in which the shape of each opening is circular (having no bulged portion) and a front side hole portion is shifted toward the outer peripheral side of the shadow mask relative to the rear side hole portion, the taper size T as an average value of the individual portions of the taper surface of the throughholes and represented by the formula $T = (S-Q)/2$, is within a range of 30-40% of the thickness of the

shadow mask as claimed. In other words, by setting the taper size T as defined in the shadow mask having specific structure as claimed within the prescribed range as claimed, such intended objectives can be achieved that the etching amount at the front side hole portion formed with larger area as compared with the rear side hole portion is reduced, thereby mechanical strength of the shadow mask against vibration and impact is improved while obtaining a desired and satisfactory electron beam spot on a fluorescent surface without causing halation or the like.

There is no description or suggestion in US '373 that the size of large and small openings and value of thickness of a shadow mask in US '373 has any relation with these features in the present invention as mentioned above, or would produce such an excellent effect as in the present invention apart from the difference of the shape in the opening.

According to the difference in the shape of the openings at a front side and a rear side of the throughholes, there is also the essential difference in the method of manufacturing each shadow mask as described in the present invention and in US '373 & '320. In short, in the method of manufacturing of the shadow mask described in US '373 & '320, a second pattern defined by a large number of arcuated independent patterns (sub-patterns) for forming bulged portions on the side of the dot pattern should be necessary (col. 8, lines 60-65 in US '373), which would make the method more complicated and less economical as compared with the method in the present invention in which such second pattern is not necessary. Hence, the shadow mask can be manufactured in an easier and more economical way.

In addition to the above, it is also noted that due to the use of such sub-patterns for the etching in order to manufacture the shadow masks disclosed in US '373 & '320, the amount of etching in the large opening should be inevitably increased, which would result in a reduction of the strength of the shadow masks as a whole and deterioration of the stability and uniformity in quality of the shadow mask as compared with the present invention.

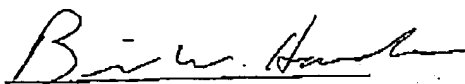
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In light of the foregoing response, all the outstanding objections and rejections are considered overcome. Applicant respectfully submits that this application should now be in condition for allowance and respectfully requests favorable consideration.

Respectfully submitted,

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Date



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